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LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR IC

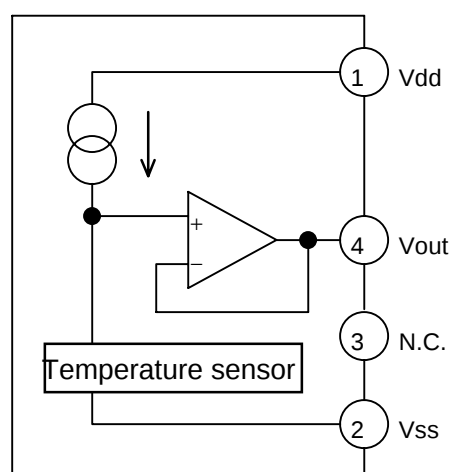
S-8120ANP

The S-8120AMP is a ultra-small packaged high-precision temperature sensor IC that outputs voltage with a temperature coefficient of $-8.5\text{mV}/^{\circ}\text{C}$ and a temperature accuracy of $\pm 2.5^{\circ}\text{C}$. A temperature sensor, a constant current circuit and an operational amplifier are integrated on a single chip to be able to operate at 2.4V. The operating temperature ranges from -40°C to $+100^{\circ}\text{C}$. The S-8120AMP is superior in linearity over conventional temperature sensors like thermistors. It can be applied to an ever expanding wide range of applications that call for high-precision thermal control.

■ Features

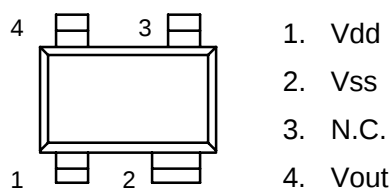
- Temperature accuracy : $\pm 2.5^{\circ}\text{C}$ ($-30^{\circ}\text{C} \sim +100^{\circ}\text{C}$)
- Linear Output Voltage : $-8.5\text{mV}/^{\circ}\text{C}$
 $T_a = -30^{\circ}\text{C}$: 1.823 V typ.
 $T_a = +30^{\circ}\text{C}$: 1.326 V typ.
 $T_a = +100^{\circ}\text{C}$: 0.718 V typ.
- Nonlinearity : $\pm 0.5\%$ typ. ($-20^{\circ}\text{C} \sim +80^{\circ}\text{C}$)
- Vss standard output
- Low voltage operation : Vdd min. = 2.4 V
- Low current consumption : Idd typ. = $4.5\mu\text{A}$ ($+25^{\circ}\text{C}$)
- Ultra-small plastic package (SC-82AB)

■ Block Diagram



■ Pin Assignment

SC-82AB



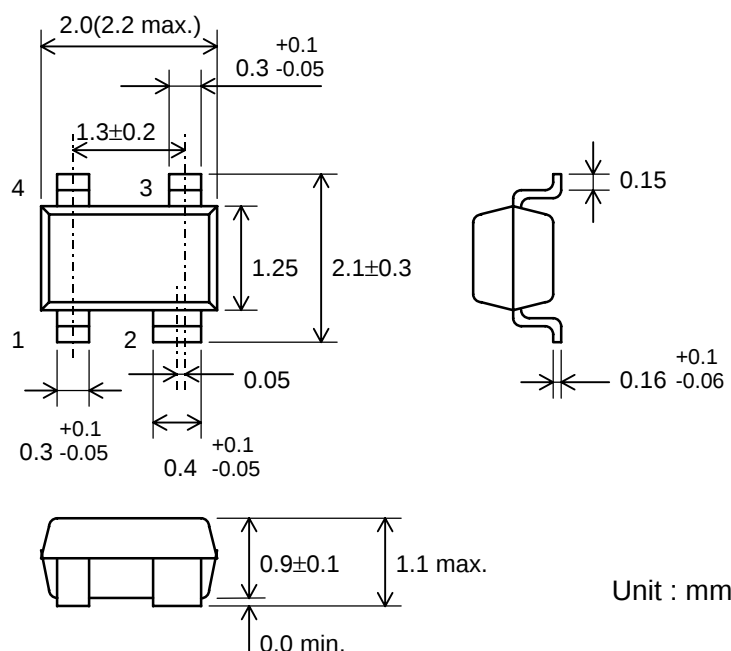
(Top view)

LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR IC

S-8120ANP

■ Dimensions

SC-82AB



■ Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Power supply Voltage (V _{SS} =0.0V)	V _{DD}	6.5	V
Output voltage	V _{OUT}	V _{SS} ~ V _{DD}	V
Operating temperature	T _{OPR}	-40 ~ +100	°C
Storage temperature	T _{STG}	-55 ~ +125	°C

■ Electrical characteristics

(40°C ≤ T_a ≤ +100°C, V_{DD}=5V)

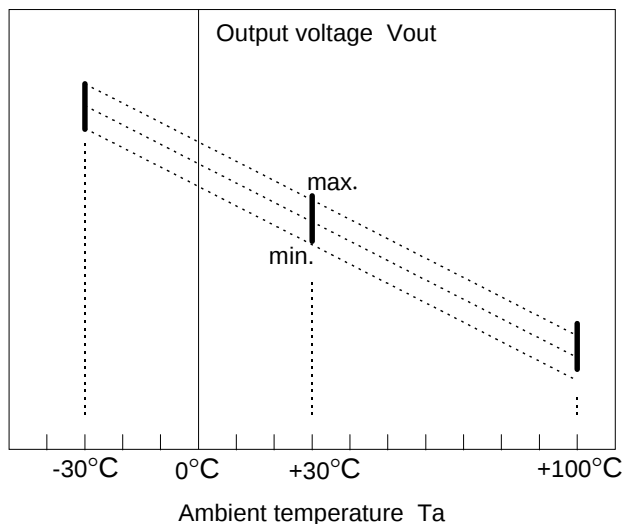
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply Voltage (V _{SS} =0.0V)	V _{DD}		2.4	—	6.0	V
Output voltage	V _{OUT}	T _a = -30°C	1.802	1.823	1.844	V
		T _a = +30°C	1.305	1.326	1.347	V
		T _a = +100°C	0.697	0.718	0.739	V
Temperature sensitivity	V _{SE}	-30 ≤ T _a ≤ +100°C	-8.78	-8.50	-8.22	mV/°C
Nonlinearity	ΔNL	-20 ≤ T _a ≤ +80°C	—	±0.5	—	%
Operating temperature	T _{OPR}		-40	—	+100	V
Current consumption	I _{DD}	T _a = +25°C	—	4.5	10.0	μA

LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR S-8120ANP

■ Definition of terms

1. Output voltage (Vout)

Output voltage Vout is defined as the voltage between measured pin-4 and Vss.
Vout is linearly proportional to ambient temperature.
S-8120ANP is tested for Vout at -30°C, +30°C and +100°C.



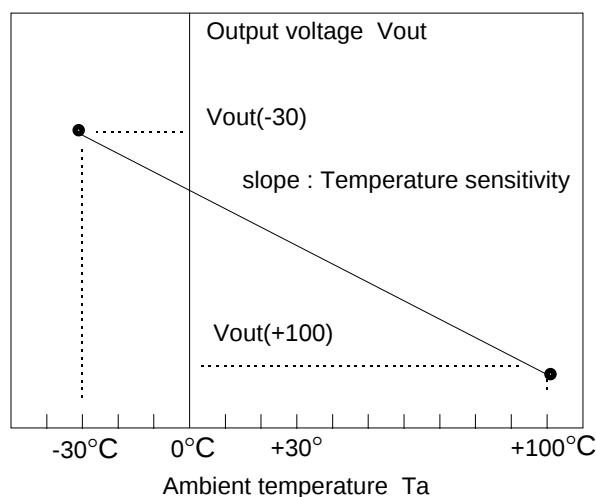
2. Temperature sensitivity (Vse)

Temperature sensitivity Vse is defined as the average slope of the Vout versus Ta curve using the following formula.

$$V_{se} = \frac{\{V_{out}(+100) - V_{out}(-30)\}}{130}$$

Vout(+100) : Output voltage at Ta=+100°C

Vout(- 30) : Output voltage at Ta= - 30°C



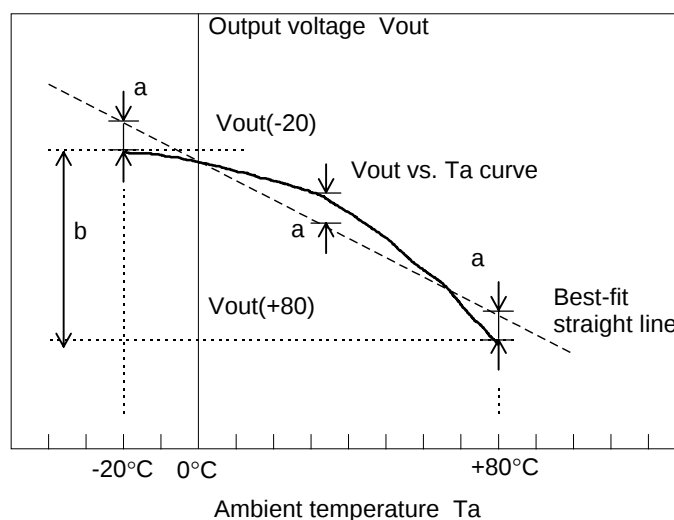
3. Nonlinearity ΔNL

Nonlinearity ΔNL is defined as the deviation of the Vout versus Ta curve from the best-fit straight line over the device's rated temperature range.

$$\Delta NL = \frac{a}{b} \sim 100$$

a : The maximum deviation of the Vout vs. Ta curve from the best-fit straight line between - 20°C and +80°C.

b : The difference of the output voltage between - 20°C and +80°C.



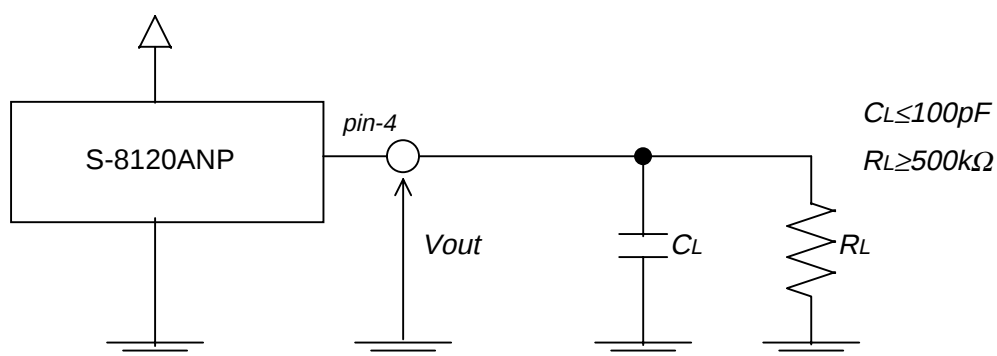
LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR S-8120ANP

■ Load conditions

Load capacitance : $C_L \leq 100\text{pF}$

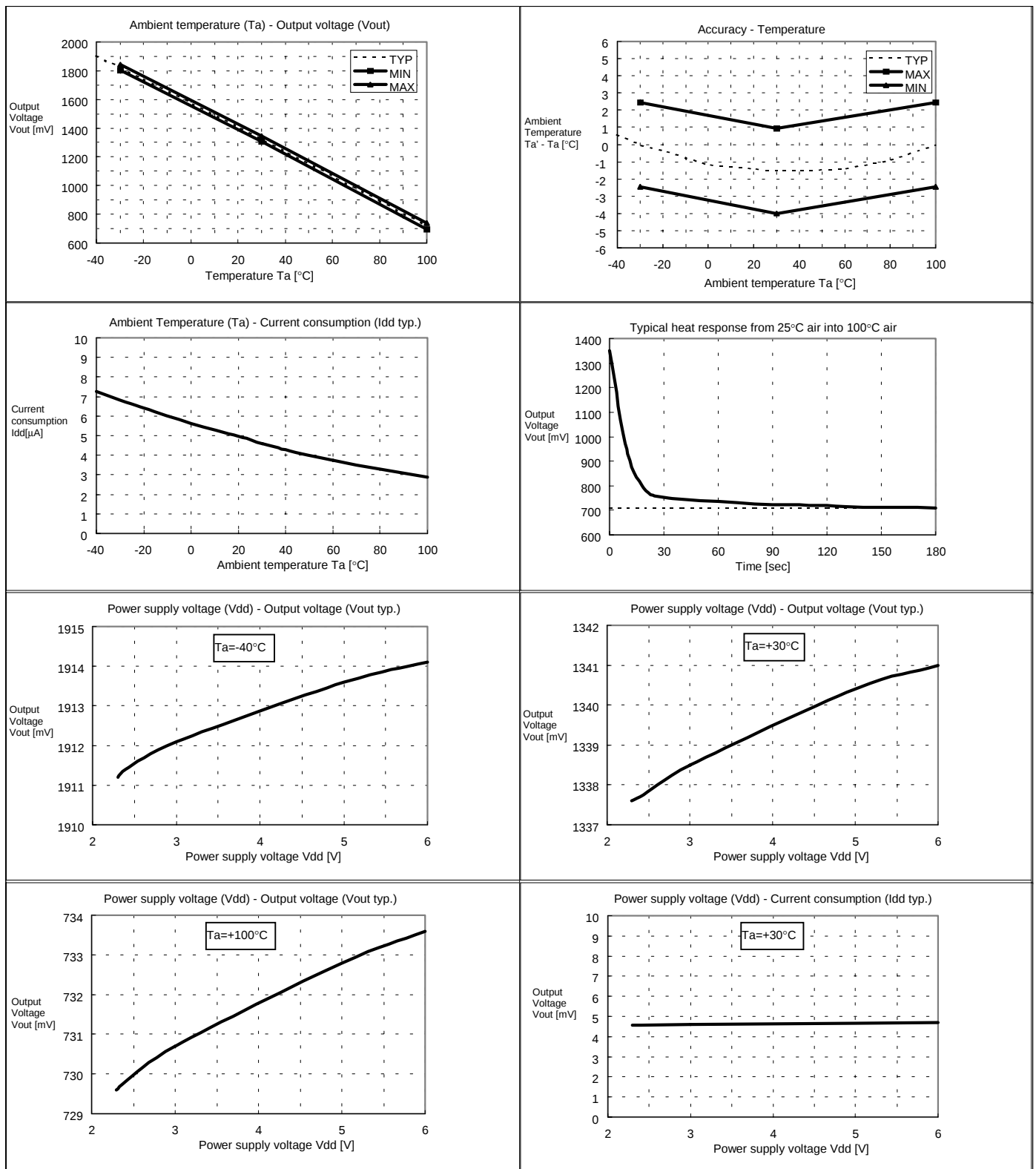
Load resistance : $R_L \geq 500\text{k}\Omega$

(Note : Do NOT connect a pull-up resistor to Vout pin.)



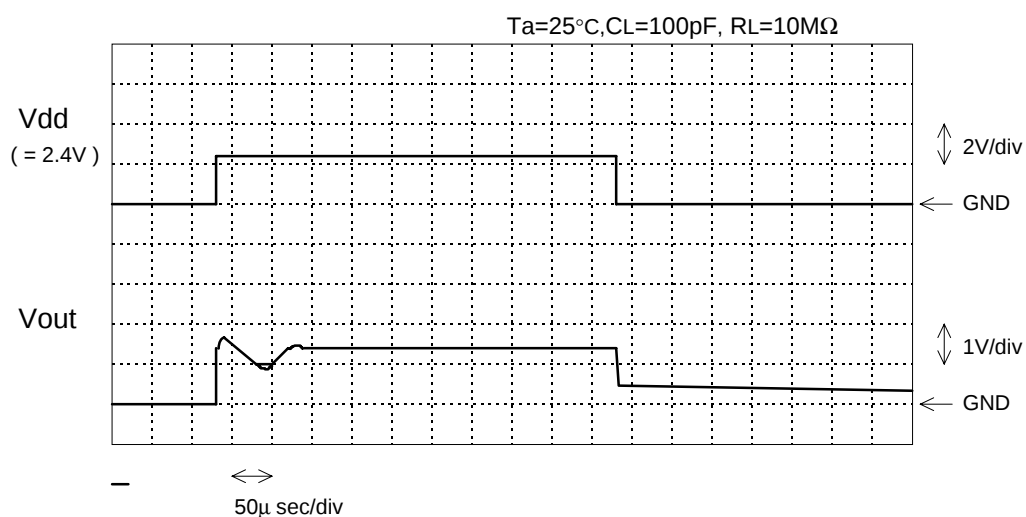
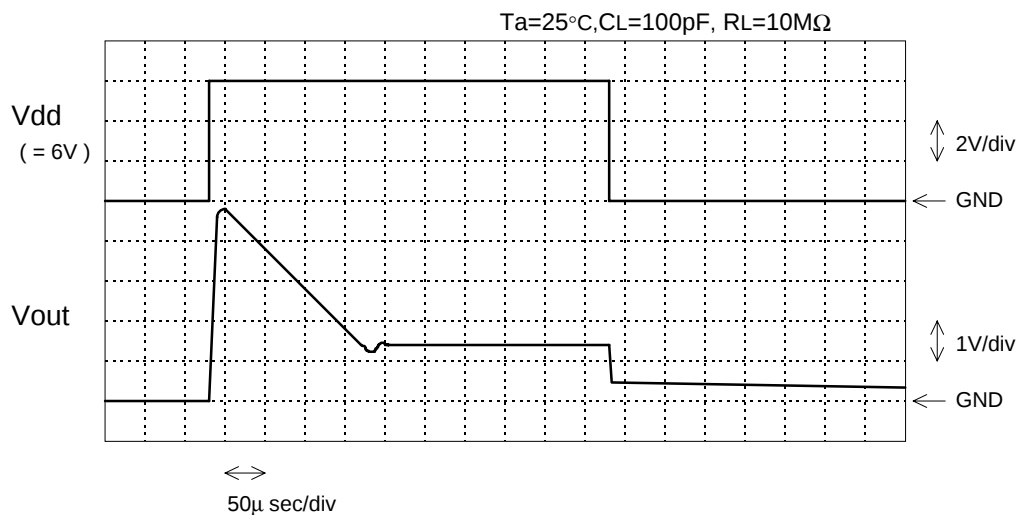
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■ Typical performance characteristics



LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR S-8120ANP

Start up response



Collection of Product FAQs

Author: Shirai Masaaki

Date: 99/05/18 (Tuesday) 16:37 (modified: 99/05/18)

<Information level>

A: Public (Printing O.K.)

Index: B: Technical

<Product>

Division name: 01 IC

Product group: 18 sensor

Category 2: 1. Temperature Sensor

Cal No.: Overall

Related documents:

Question:

What happens to the sensor output if the operating temperature range is exceeded?

Answer:

We have not yet evaluated this condition. However, we do not believe that the output would change rapidly when the operating temperature is exceeded. The output is assumed to enter a proportional or saturated state. Since exceeding the operating temperature voids our guarantee, we are not responsible for the output under such a condition.

<Remarks>

FAQ No.: 18S81x001